

AIX

HP StorageWorks Auto Path for AIX installation guide

product version: 04.03

eighth edition (January 2004)

part number: B7949-96006

This guide is a supplement to the *Hitachi Dynamic Link Manager User's Guide* and describes how to install and configure Auto Path for AIX with HP disk arrays.



© Copyright 2003-2004 Hewlett-Packard Development Company, L.P., all rights reserved

Hewlett-Packard Company makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Hewlett-Packard shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

This document contains proprietary information, which is protected by copyright. No part of this document may be photocopied, reproduced, or translated into another language without the prior written consent of Hewlett-Packard. The information contained in this document is subject to change without notice.

All other product names mentioned herein may be trademarks of their respective companies.

Hewlett-Packard Company shall not be liable for technical or editorial errors or omissions contained herein. The information is provided "as is" without warranty of any kind and is subject to change without notice. The warranties for Hewlett-Packard Company products are set forth in the express limited warranty statements accompanying such products. Nothing herein should be construed as constituting an additional warranty.

Printed in the U.S.A.

HP StorageWorks Auto Path for AIX: Installation Guide

product version: 04.03
eighth edition (January 2004)
part number: B7949-96006

Contents

About this guide	5
Intended audience	5
Disk arrays	5
Related documentation	6
Conventions	6
Getting help	7
HP technical support	7
HP storage website	7
HP authorized reseller	8
Revision history	9
Warranty statement	10
1 Installation	13
Installing Auto Path in AIX environments	14
System prerequisites for using the Auto Path software	15
Disk array firmware and software dependencies	15
Installation procedure	16
Upgrading to version 04.03	20
2 Operation	23
Setting the automatic failback feature using the <code>dlmkmgr</code> command	24
Error indication on the last path	25
Using the <code>dlmkmgr online</code> command	25
Identifying the Auto Path driver volumes	25
Index	29

About this guide

This guide provides information about configuring the HP StorageWorks Auto Path for AIX software for supported HP disk arrays.

Auto Path requires Hitachi Dynamic Link Manager (HDLM) software. This guide is a supplement to the *Hitachi Dynamic Link Manager User's Guide*.

Before installing Auto Path, refer to the **readme** file for instructions and restrictions. The procedures described in this guide and the **readme** file supersede the instructions provided in the *Hitachi Dynamic Link Manager User's Guide*. The GUI information in the *Hitachi Dynamic Link Manager User's Guide* does not apply.

Intended audience

This guide is intended for use by system administrators who have expertise with the associated systems and software and knowledge of related topics:

- data processing concepts
- disk arrays and RAID technology
- operating system commands and utilities

Disk arrays

Unless otherwise noted, the term *disk array* refers to these disk arrays:

HP Surestore Disk Array XP48
HP StorageWorks Disk Array XP128
HP Surestore Disk Array XP256
HP Surestore Disk Array XP512
HP StorageWorks Disk Array XP1024
HP OpenView Continuous Access Storage Appliance (CASA)

Related documentation

HP provides the following related documentation:

- *HP StorageWorks Disk Array XP128: Owner's Guide*
- *HP StorageWorks Disk Array XP1024: Owner's Guide*
- *HP StorageWorks Command View XP for XP Disk Arrays: User Guide*

For information about operating system commands and third-party products, refer to the manufacturer's documentation.

Conventions

This guide uses the following text conventions.

Figure 1	Blue text represents a cross-reference. For the online version of this guide, the reference is linked to the target.
<u>www.hp.com</u>	Underlined, blue text represents a website on the Internet. For the online version of this guide, the reference is linked to the target.
literal	Bold text represents literal values that you type exactly as shown, as well as key and field names, menu items, buttons, file names, application names, and dialog box titles.
<i>variable</i>	Italics indicates that you must supply a value. Italics is also used for manual titles.
input/output	Monospace font denotes user input and system responses, such as output and messages.
<i>Example</i>	Denotes an input or output example. The display shown in this guide may not match your configuration exactly.
[]	Indicates an optional parameter.
{ }	Indicates that you must specify at least one of the listed options.
	Separates alternatives in a list of options.

Getting help

If you still have a question after reading this guide, contact an HP authorized service provider or access our website:

www.hp.com

HP technical support

In North America, call technical support at 1-800-652-6672, available 24 hours a day, 7 days a week.

Outside North America, call technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the HP website under support:

<http://h18006.www1.hp.com/storage/arrayystems.html>

Be sure to have the following information available before calling:

- technical support registration number (if applicable)
- product serial numbers
- product model names and numbers
- applicable error messages
- operating system type and revision level
- detailed, specific questions

For continuous quality improvement, calls may be recorded or monitored.

HP storage website

For the most current information about HP StorageWorks XP products, visit the support website:

<http://h18006.www1.hp.com/storage/arrayystems.html>

For information about product availability, configuration, and connectivity, consult your HP account representative.

HP authorized reseller

For the name of your nearest HP authorized reseller, you can obtain information by telephone:

United States 1-800-345-1518

Canada 1-800-263-5868

Or contact: www.hp.com

Revision history

January 2004	Minor update for product version 04.03.
--------------	---

Warranty statement

HP warrants that for a period of ninety calendar days from the date of purchase, as evidenced by a copy of the invoice, the media on which the Software is furnished (if any) will be free of defects in materials and workmanship under normal use.

DISCLAIMER. EXCEPT FOR THE FOREGOING AND TO THE EXTENT ALLOWED BY LOCAL LAW, THIS SOFTWARE IS PROVIDED TO YOU “AS IS” WITHOUT WARRANTIES OF ANY KIND, WHETHER ORAL OR WRITTEN, EXPRESS OR IMPLIED. HP SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY, SATISFACTORY QUALITY, NON-INFRINGEMENT, TITLE, ACCURACY OF INFORMATIONAL CONTENT, AND FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow exclusions of implied warranties or conditions, so the above exclusion may not apply to you to the extent prohibited by such local laws. You may have other rights that vary from country to country, state to state, or province to province.

WARNING! YOU EXPRESSLY ACKNOWLEDGE AND AGREE THAT USE OF THE SOFTWARE IS AT YOUR SOLE RISK. HP DOES NOT WARRANT THAT THE FUNCTIONS CONTAINED IN THE SOFTWARE WILL MEET YOUR REQUIREMENTS, OR THAT THE OPERATION OF THE SOFTWARE WILL BE UNINTERRUPTED, VIRUS-FREE OR ERROR-FREE, OR THAT DEFECTS IN THE SOFTWARE WILL BE CORRECTED. THE ENTIRE RISK AS TO THE RESULTS AND PERFORMANCE OF THE SOFTWARE IS ASSUMED BY YOU. HP DOES NOT WARRANT OR MAKE ANY REPRESENTATIONS REGARDING THE USE OR THE RESULTS OF THE USE OF THE SOFTWARE OR RELATED DOCUMENTATION IN TERMS OF THEIR CORRECTNESS, ACCURACY, RELIABILITY, CURRENTNESS, OR OTHERWISE. NO ORAL OR WRITTEN INFORMATION OR ADVICE GIVEN BY HP OR HP’S AUTHORIZED REPRESENTATIVES SHALL CREATE A WARRANTY.

LIMITATION OF LIABILITY. EXCEPT TO THE EXTENT PROHIBITED BY LOCAL LAW, IN NO EVENT INCLUDING NEGLIGENCE WILL HP OR ITS SUBSIDIARIES, AFFILIATES, DIRECTORS, OFFICERS, EMPLOYEES, AGENTS OR SUPPLIERS BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR OTHER DAMAGES (INCLUDING LOST PROFIT, LOST DATA, OR DOWNTIME COSTS), ARISING OUT OF THE USE, INABILITY TO USE, OR THE RESULTS OF USE OF THE SOFTWARE, WHETHER BASED IN WARRANTY, CONTRACT, TORT OR OTHER LEGAL THEORY, AND WHETHER OR NOT ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. Your use of the Software is entirely at your own risk. Should the Software prove defective, you assume the entire cost of all service, repair or correction. Some jurisdictions do not allow the exclusion or limitation of liability for incidental or consequential damages, so the above limitation may not apply to you to the extent prohibited by such local laws.

NOTE. EXCEPT TO THE EXTENT ALLOWED BY LOCAL LAW, THESE WARRANTY TERMS DO NOT EXCLUDE, RESTRICT OR MODIFY, AND ARE IN ADDITION TO, THE MANDATORY STATUTORY RIGHTS APPLICABLE TO THE LICENSE OF THE SOFTWARE TO YOU; PROVIDED, HOWEVER, THAT THE CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS IS SPECIFICALLY DISCLAIMED AND SHALL NOT GOVERN OR APPLY TO THE SOFTWARE PROVIDED IN CONNECTION WITH THIS WARRANTY STATEMENT.

Installation

This chapter describes how to install HP StorageWorks Auto Path for AIX for use with HP disk arrays.

Use these instructions instead of the procedures provided in the *Hitachi Dynamic Link Manager User's Guide*.

Installing Auto Path in AIX environments

Before beginning installation, configure the AIX environment for Auto Path support and observe the following requirements.

- A license key is required before installation.
- After you create DLM devices, use only **dln** commands for these devices. Do not use standard operating system commands. For example, use **/usr/DynamicLinkManager/bin/dlmmkvg** instead of **/usr/sbin/mkvg**.
- After creating a volume group on a DLM device, do not reference the underlying hdisk (as displayed with the **lsdev** command).

Auto Path 04.03 can be configured to issue an error when the underlying hdisk is referenced using the **dlmodmset** command. See the *Hitachi Dynamic Link Manager User's Guide* for more information.

- Persistent reservation must be disabled when using Auto Path with a Continuous Access Storage Appliance (CASA).

All paths to the same LUN must have the same type of HBA with identical firmware.

Caution *If you combine different types of HBAs, Auto Path may not be able to switch the path when an error occurs.*

- Auto Path cannot be used to manage the boot disk.
- Uninstall any versions of Auto Path older than 04.02 before installing the version 04.03 software. See “Upgrading to version 04.03 ([page 20](#))”

Recommendation: Use the same type of fiber switch for all paths.

System prerequisites for using the Auto Path software

HP supports the following operating system environments:

- AIX 4.3.3 with a maintenance level of 09 or later; patch IY37841
- AIX 5.1 with a maintenance level of 02 or later; patches IY37437 and IY43734
- AIX 5.2 with patches IY39860 and IY44133

Related information See the Hitachi Dynamic Link Manager documentation for other user information.

Disk array firmware and software dependencies

See the **readme** file on the Auto Path for AIX CD for firmware revision and software version requirements.

Installation procedure

Configure the disk array LUNs to be accessible through at least one port in each cluster of the array. That is one port in CL1 and the other in CL2.

Make the appropriate connections between the host HBAs and the disk array ports.

Configure host bus adaptors (HBAs) and switches. See the HBA product documentation for the configuration method and settings. Verify that the Fibre Channel connection method (such as Fabric or AL) matches the settings.

Install VisualAge C++ (version 5.0.0.0 or later) filesets on the host if required. AIX 4.3.3 software may be obtained at:

<http://www-1.ibm.com/support/docview.wss?org=SW&doc=4001173>

For AIX 5.1 and AIX 5.2, the software is available on its respective install medium.

To install Auto Path:

1. Log in as root.
2. Create the **/var/DLM** directory:
mkdir /var/DLM
3. Create the **dml.lic_key** license key file.

Example

```
# echo "123456789ABCDEF" > /var/DLM/dml.lic_key
```

where “123456789ABCDEF” is the license key number.

If you want, you can use **vi** to edit the file.

4. Insert the CD into the drive.

There is no need to mount the CD.

5. Execute the install command:

```
# installp -aXgd /dev/cd0 all
```

Alternately, you can specify the special file of the installation medium in place of **/dev/cd0**.

6. Verify that the package was installed:

```
# lspp -L AutoPath.rte
```

Verify that **AutoPath.rte** appears among the file set items in the output list and that its status is C (Commit). See the **readme** file on the Auto Path for AIX CD for the current level.

7. (Optional) Add the PATH environment variable to the execution environment:

Bourne shell or Korn shell

```
# PATH=$PATH:/usr/DynamicLinkManager/bin
# export PATH
```

C shell

```
# set path=( $path /usr/DynamicLinkManager/bin )
```

If you want, you can edit the **PATH** statement in the root **.profile**.

8. Define the physical volumes to be managed by Auto Path.

If you want to let the DLM driver recognize all volumes that can be managed by the DLM driver, this step is unnecessary. Continue with step 9.

To limit the volumes to be managed, you may either specify the volumes to be managed or specify the volumes you do not want managed.

Example

To specify the volumes to be managed, enter the logical names of these volumes (hdisks) in the configuration file:

```
/usr/DynamicLinkManager/drv/dlmfdrv.conf
```

Enter all hdisk references for paths to the same LUN. If only volumes hdisk5 and hdisk7 are used with Auto Path and reference paths to the same LUN, **dlmfdrv.conf** will contain the following:

```
hdisk5
hdisk7
```

Example

To specify the volumes to not be managed, enter the logical names of these volumes (hdisks) in the **unconf** file:

```
/usr/DynamicLinkManager/drv/dlmfdrv.unconf
```

If physical volumes `hdisk4` and `hdisk6` are not to be recognized by the DLM driver, **`dlmfdrv.unconf`** will contain the following:

```
hdisk4
hdisk6
```

If **`dlmfdrv.unconf`** and **`dlmfdrv.conf`** do not exist, the Auto Path configuration manager automatically creates the instances of the devices for all of the disks supported by Auto Path.

9. Execute the Auto Path configuration manager command:

```
# dlmcfmgr
```

10. Verify that the Auto Path subsystem (DLManager) is active:

```
# lssrc -a | grep DLManager
```

A system reboot also activates the Auto Path subsystem.

11. Verify that the Auto Path drivers (**`dlmfdrvn`**) and alert driver (**`dlmadrv`**) are installed on an active kernel and available.

Example

```
# lsdev -C | grep dlm
dlmfdrv0    Available    HDLM Driver
dlmadrv     Available    HDLM Alert Driver
. . .
dlmfdrv1    Available    HDLM Driver
dlmfdrvio   Available    HDLM Driver
```

In this example:

`dlmadrv` is the special file name of the Auto Path alert driver.

`dlmfdrvio` is the driver instance for internally managing Auto Path.

`dlmfdrv0` and **`dlmfdrv1`** are the special file names of Auto Path drivers. Each driver instance represents all paths to the same LU. The Auto Path driver name does not relate to the `hdisk` or LU names. The instances start with **`dlmfdrv0`** and increment sequentially.

Verify that all Auto Path drivers representing the disk array LUNs you want recognized are displayed. If one or more drivers are not displayed, AIX error information is logged to the following file: **`/var/DynamicLinkManager/log/dlmcfmgr1.log`**. For details about the log file, see the AIX documentation.

12. Create a volume group.

To specify a physical volume group, specify the Auto Path device representing the LU.

Example

If hdisk4, hdisk5 and hdisk6 are in the same LU and represented by Auto Path device file dlmfdrv1:

```
# dlmmkvg -s 32 -y dlmvg01 dlmfdrv1
```

Recommendation

Use a SMIT Window for volume operations. For SMIT Window information see the *Hitachi Dynamic Link Manager User's Guide*.

13. Verify the volume group:

```
# dlmlsvg
```

14. Create a file system.

Example

To create a file system having the size 8192000 at the mount point **/tmp/dlmvg01_fs** for the dlmvg01 volume group:

```
# crfs -v jfs -g 'dlmvg01' -a size='8192000'  
-m '/tmp/dlmvg01_fs'
```

15. Make the mount point available.

Example

```
# mount /tmp/dlmvg01_fs
```

16. Verify the mount point:

```
# df -k
```

Upgrading to version 04.03

Recommendation Before change to the file systems (such as this upgrade), make a backup copy of data stored on the system.

Be sure that all 04.03 prerequisite conditions are met before proceeding with the upgrade.

Halt all activity with the file systems for the duration of the upgrade.

It is no longer necessary to uninstall the previous version of Auto Path.

To upgrade:

1. Unmount all Auto Path file systems.
2. Deactivate all Auto Path (HDLM) volume groups.

Example `# dlmvaryoffvg dlmvg01`

3. Save the **dlmfdrv.conf** or **dlmfdrv.unconf** file to a safe place.

Example `# cp /usr/DynamicLinkManager/drv/dlmfdrv.conf /tmp`

4. Remove the Auto Path devices created with the previous version:

`# dlmrmdev`

5. Verify that no other software is using the Hitachi Network Objectplaza trace common library (HNTRLib). Then uninstall this library.

`# /opt/hitachi/HNTRLib/etc/hntrsetup`

 When the HNTRLib setup menu appears, Select 9.

6. Make sure the appropriate license key is in the **/var/DLM/dlm.lic_key** file.

 Make a backup of this file. The version 04.03 installation will delete this file and the **/var/DLM** directory.

7. Insert the Auto Path 04.03 CD into the drive. There is no need to mount the CD.

8. Execute the install command:

```
# installp -aXgd /dev/cd0 all
```

Alternately, you can specify the special file of the installation medium in place of **/dev/cd0**.

9. Verify that the package was installed:

```
# lspp -L AutoPath.rte
```

Verify that **AutoPath.rte** appears among the file set items in the output list and that its status is C (Commit). See the **readme** file on the Auto Path for AIX CD for the current level.

10. Verify that the **dlnmfdrv.conf** or **dlnmfdrv.unconf** file is in the **/usr/DynamicLinkManager/drv** directory.

11. Activate the Auto Path subsystem:

```
# dlnmcfgmgr
```

A system reboot also activates the Auto Path subsystem (DLManager).

The dlnmfdrv device files are regenerated as configured in the **dlnmfdrv.conf** or **dlnmfdrv.unconf** file.

12. Activate all of the Auto Path (HDLM) volume groups.

Example # dlnmvaryonvg dlnmvg01

13. Make the mount point available.

Example # mount /tmp/dlnmvg01_fs

2

Operation

This chapter provides information about Auto Path operations with HP disk arrays.

Setting the automatic failback feature using the `dlnmgr` command

Use the **`dlnmgr`** command to set up automatic failback.

`dlnmgr set -afb { on [-intvl Interval_Time] | off } [-s]`

The **`dlnmgr`** command sets whether automatic failback is used for failed paths. The default setting is **`off`**.

- `-afb`** Specify whether or not automatic failback is used for failed paths.
- `on`** Automatic failback of the failed paths is performed at a specified interval. The recovered path is returned online.
- `off`** Automatic failback is not performed.
- `-intvl`** Specify the time interval for automatic failback with a value between 1 and 1440 (minutes). When no value is set for this parameter, the value previously set or 1 minute (default) is used for failback processing. When automatic failback is newly turned on, or the Auto Path manager is activated. The first automatic failback is performed after the duration interval specified.

Settings on automatic failback remain after the system is turned off and restarted. The interval value is maintained even after automatic failback is turned off. The stored value is used when automatic failback is set on again and no value is set for the interval at that time.

Only the paths containing an error are subject to the automatic failback operation.

The paths reporting errors when the Auto Path manager is activated are also included in the automatic failback operation.

With the addition of the automatic failback, only normal paths are subject to health check.

Error indication on the last path

When the state of the paths is displayed with **dlmkmgr view -path** command, the last path for a device remains online. It does not go offline even if an error occurs. The path containing an error is now indicated as Online(E).

- The Online(E) path returns online if input and output can be successfully executed.
- The **dlmkmgr online** command or automatic fallback returns the Online(E) path online only.

Using the dlmkmgr online command

If **-pathid** is not specified in the **dlmkmgr online** operation, all the paths in hold state are subject to online processing. If there is a path that cannot be recovered, the following message is output:

```
A path which failed to go online was detected during
online operation of the KAPL01039-W DLM command. Do
you want to continue the PathID = %d online
operation? [y/n]? Enter "y" to continue the
operation, or "n" to abort it.
```

When **-s** is specified, the operation is continued on the assumption that “y” is specified.

You can execute the **dlmkmgr view -path** command to show the status of the LUN paths.

```
# dlmkmgr view -path
```

Identifying the Auto Path driver volumes

To view the hdisks that belong to a dlmfdrv device, execute the following command:

```
# dlmkmgr view -drv
```

Commands for operations with Auto Path volume groups

Auto Path cannot use disks that are recognized by AIX unless you take some special measures. Auto Path provides utility commands for operations on Auto Path volume groups.

A volume group created using the commands from Auto Path can be used only for Auto Path. The Auto Path utility commands for operations with Auto Path volume groups correspond to the commands executed in the SMIT screen “HDLM Volume Group.”

You can execute Auto Path volume group utility commands from the command line or in the SMIT screen.

The format of each Auto Path utility command is the same as the format of the corresponding AIX command. The return values are the same as those of the corresponding AIX commands.

The error messages and Help output for the commands from the Auto Path volume group utility commands are the same as those of the corresponding for AIX commands.

If you perform volume group operations on Auto Path volume groups without using the Auto Path volume group utility commands, the volume group may become invalid. In this case, use AIX commands to correct this situation. (See the example.)

Recommendation Use SMIT when you use the Auto Path volume group utility commands. When you use SMIT to select physical disks, SMIT displays only the first physical disk registered in ODM. This allows you to easily specify the physical disks allocated for Auto Path of the same LU, all at one time.

Related information See the *Hitachi Dynamic Link Manager User's Guide* for the commands to be used on Auto Path (DLM) volume groups.

A volume group managed by Auto Path must contain only dlmfdrvXX designations. Do not include an hdisk definition in an Auto Path volume group.

When you use an Auto Path volume group command, specify the AIX name (for example, hdisk1) as the physical volume name. However, after you have performed operations on the volume group, the volume name is changed to an Auto Path name (for example, dlmfdrv1).

Do not specify any volume group other than a volume group created using the Auto Path volume group utility commands. Doing so may cause the volume group to become invalid.

Example Create a volume group for Auto Path:

```
# dlmmkvg -s 32 -y dlmvg1 dlmfdrv2 dlmfdrv3  
  
# dlmlsvg
```

Invalid volume group For a volume group used by Auto Path that includes an hdisk:

```
# dlmlsvg -p dlmvg1  
dlmvg1:  
PV_NAME PV STATE TOTAL PPs FREE PPs FREE  
DISTRIBUTION  
dlmfdrv2 active 542 36 00..00..00..00..36  
dlmfdrv3 active 542 36 00..00..00..00..36  
hdisk4 active 542 36 00..00..00..00..36
```

See the *Hitachi Dynamic Link Manager User's Guide* for commands to correct the condition, as well as the complete set of Auto Path (HDL) volume group utility commands.

A

- alert driver 18
- audience
 - intended 5
- authorized reseller, HP 8

B

- before installation 14

C

- commands for volume group operations 26
- conventions
 - documentation 6

D

- dependencies 15
- disk arrays
 - supported 5
- dlnm commands 14
- dlnmodmset command 14
- dlnkmgr command 24
- dlnkmgr online command 25
- dlnkmgr view -path command 25
- documentation
 - conventions 6
 - related 6

E

- environment variable, PATH 17
- error indication 25
- error messages 26

F

- failback feature, automatic 24

H

- HBA 14
- help
 - obtaining 7
- help output 26
- Hitachi Dynamic Link Manager User's Guide 13
- HP
 - authorized reseller 8
 - technical support 7

I

- install command 21
- Installation 13
- installation procedure 16
- installation, preparation 14
- installation, verifying 17

L

- license key 14, 16, 20

P

- PATH environment variable 17
- path error 25
- persistent reservation 14
- physical volumes 17
- prerequisites 15

R

- related documentation
 - list of 6

S

- software dependencies 15
- system administrator
 - required knowledge 5

T

- technical support
 - HP 7

U

- upgrading to version 04.03 20

V

- verify installation 17
- volume group, creating 27
- volumes to be managed 17
- volumes, physical 17

X

- XP1024
 - support for 5